

## Using Accelerated Tests to Predict Service Life of Materials Subjected to Outdoor Weathering

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Today's manufacturers need accelerated test (AT) methods to predict service life in a timely manner. For example, automobile manufacturers would like to develop a 3-month test to predict 10-year field reliability of a coating system. Developing a methodology to simulate outdoor weathering is a particularly challenging task. Difficulties arise, for example, because the intensity and the frequency spectrum of ultraviolet (UV) radiation from the Sun are highly variable, both temporally and spatially and because there is often little understanding of how environmental variables affect chemical degradation processes.

This talk describes the statistical aspects of a cooperative project being conducted NIST to generate necessary experimental data and the development of a model relating cumulative damage to environmental variables like UV spectrum and intensity, as well as temperature and relative humidity. The parameters of the cumulative damage model can be estimated from laboratory data. The model will be verified by comparing with specimens tested in an outdoor environment for which the environmental variables were carefully measured. Predictions for future service life can be made as a function of a stochastic process model that characterizes environmental. Using a spatial-temporal model for weather, one can make predictions for a product population.